

Investigations of Texture Effects on Ride Quality Measurements

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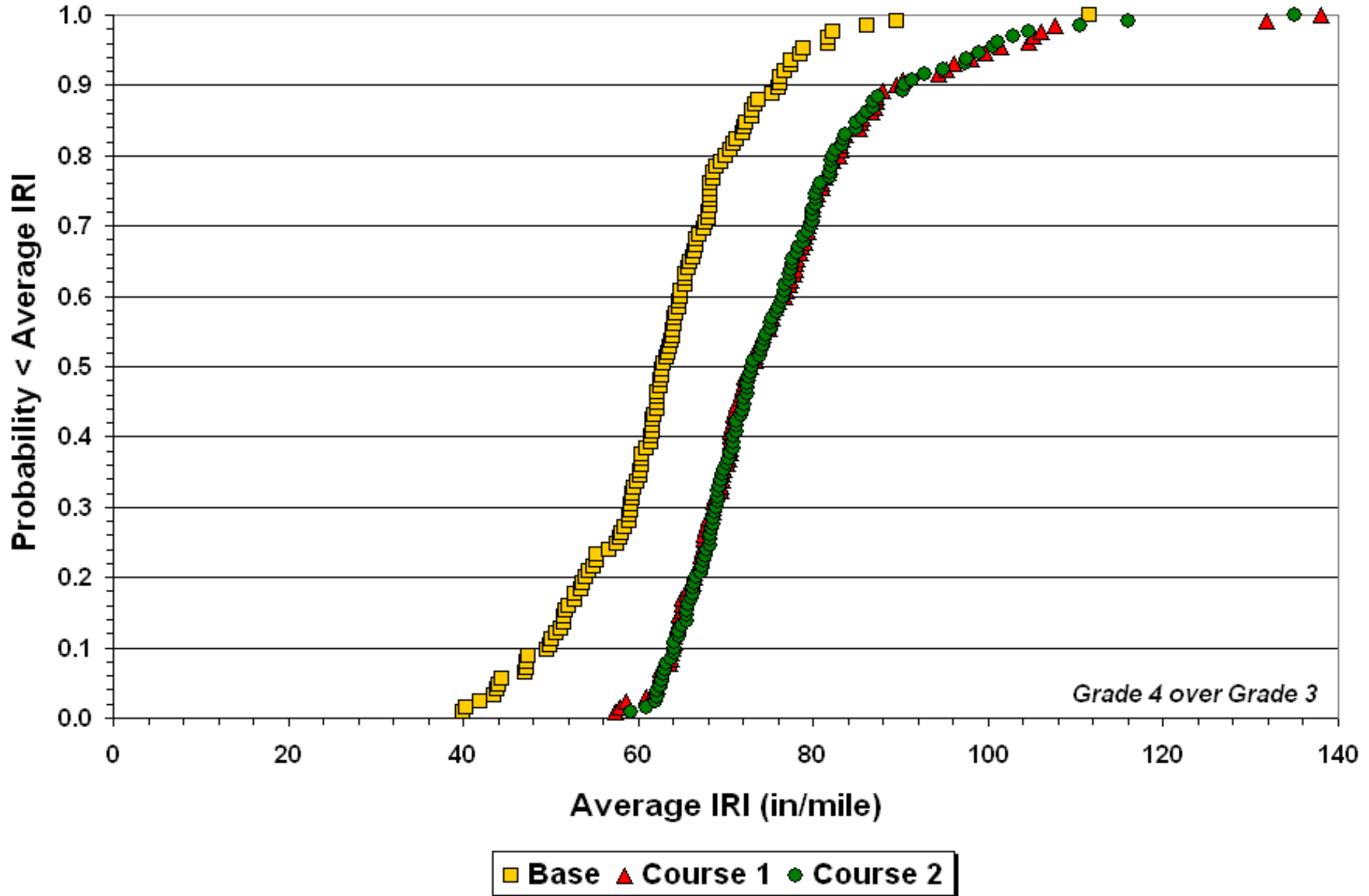
RPUG, Austin, Texas 2008



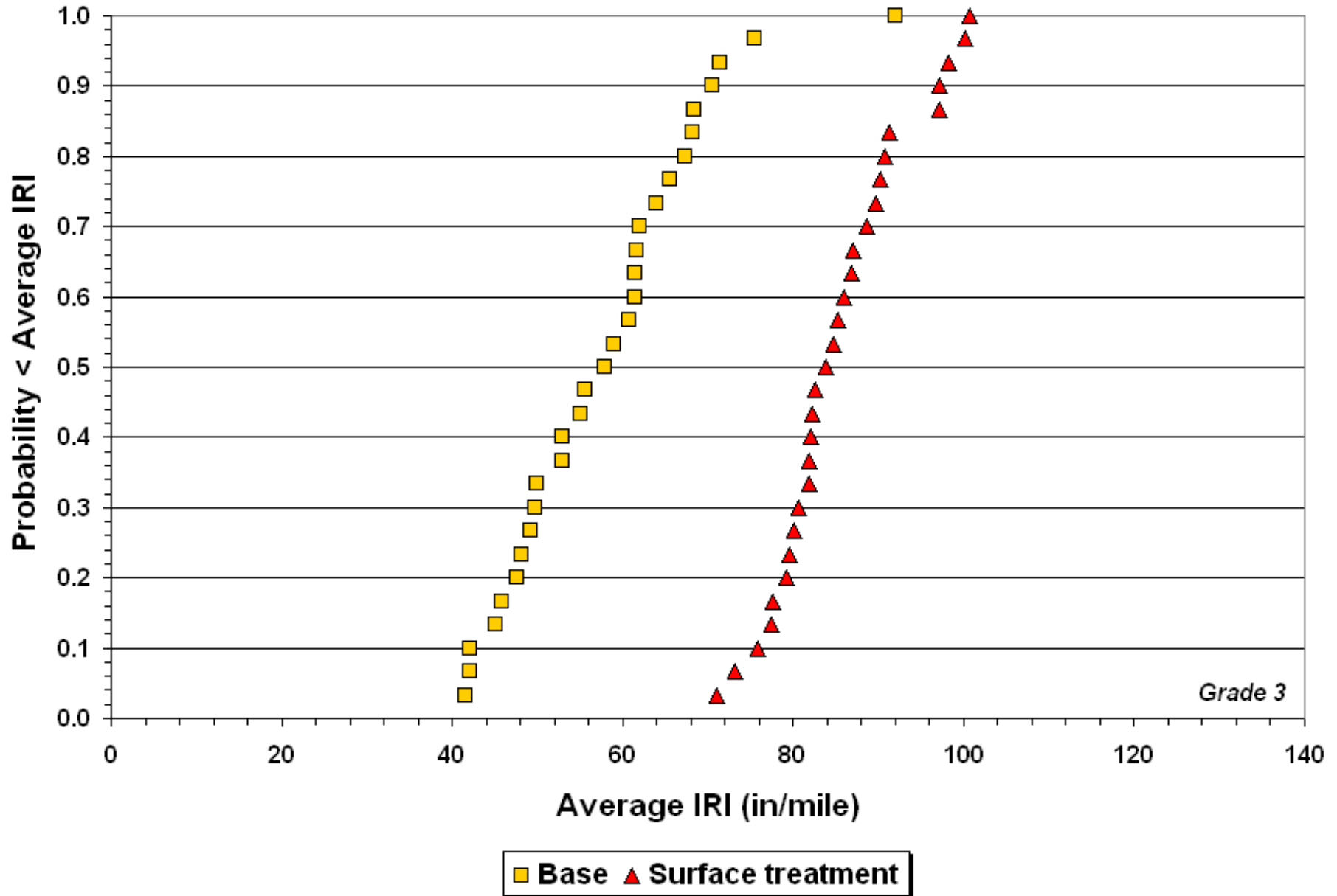
Background

- ***TxDOT added a flexible base ride provision to Item 247***
- ***Special provision requires inertial profile measurements on flexible base***
- ***Correct sections with average IRI > 125 in/mile to IRI \leq 125 in/mile per wheel path***
- ***Observations from field projects suggest texture influence on IRI of surface treatment***

Observations from SH349 Project



Observations from FM2401 Project





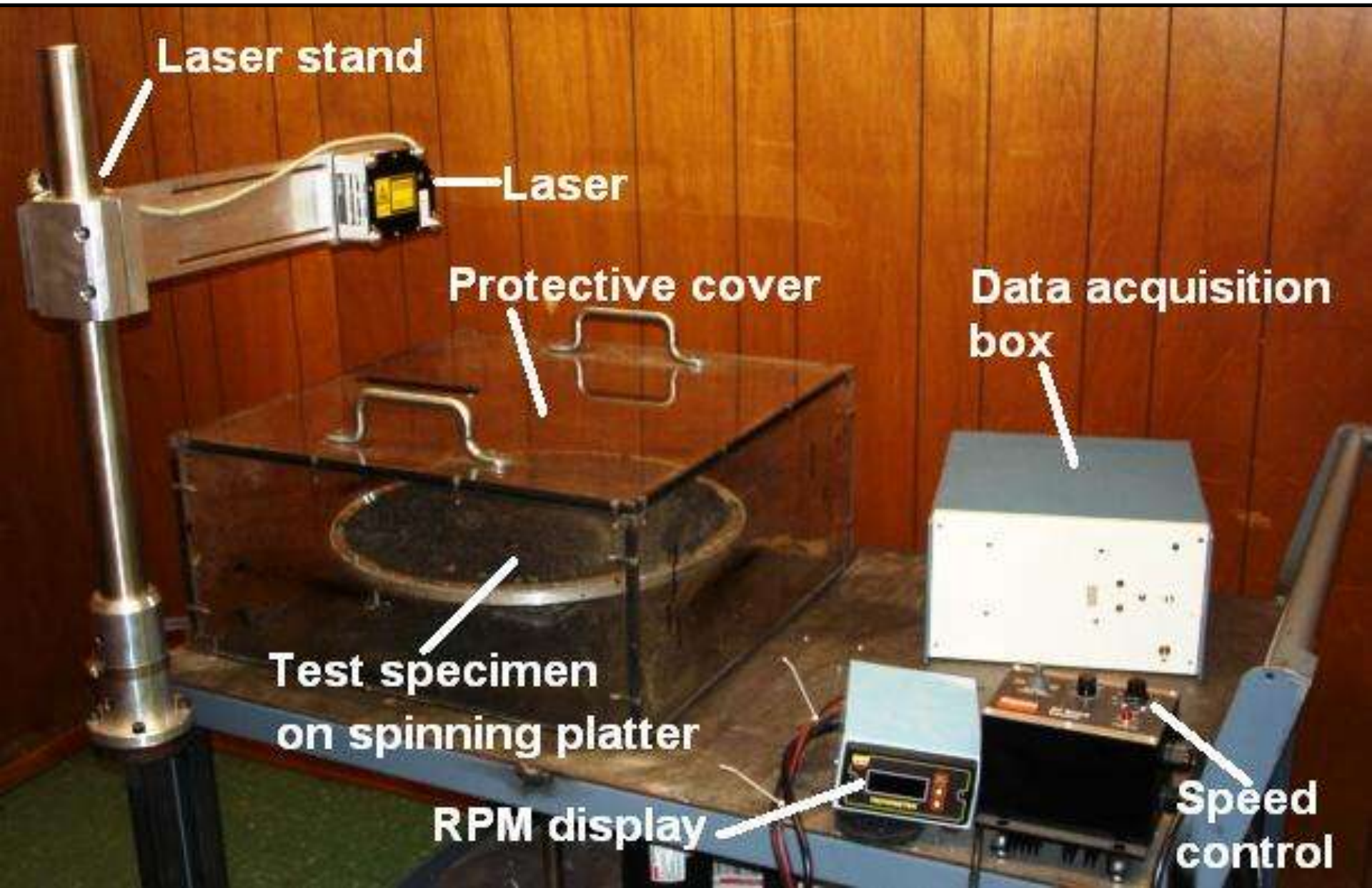
Questions from Ride Quality Measurements on Textured Surfaces

- **Does texture affect IRI?**
- **Why is texture affecting IRI?**
- **Can we quantify an IRI offset based on surface texture measurement for TxDOT's current ride specifications?**

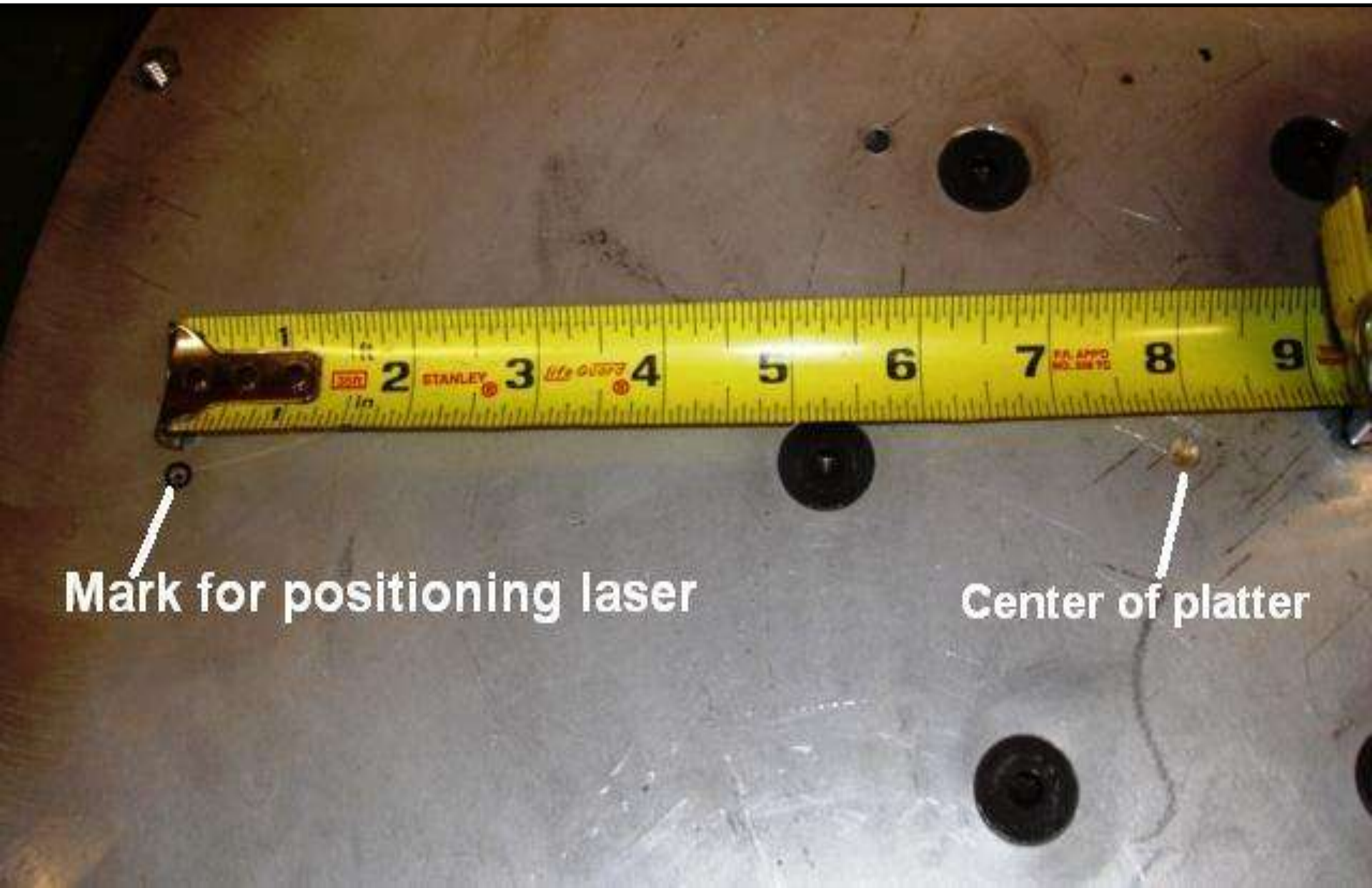
Laboratory Tests to

Investigate Texture Effects

Laboratory Setup



Laboratory Setup



Mark for positioning laser

Center of platter

Laboratory Setup



Alignment pin

Laboratory Setup



**Slot for laser
beam**

Test Specimens



Grade 3



Grade 3 over 3



Grade 5



Grade 4



Grade 4 over 3



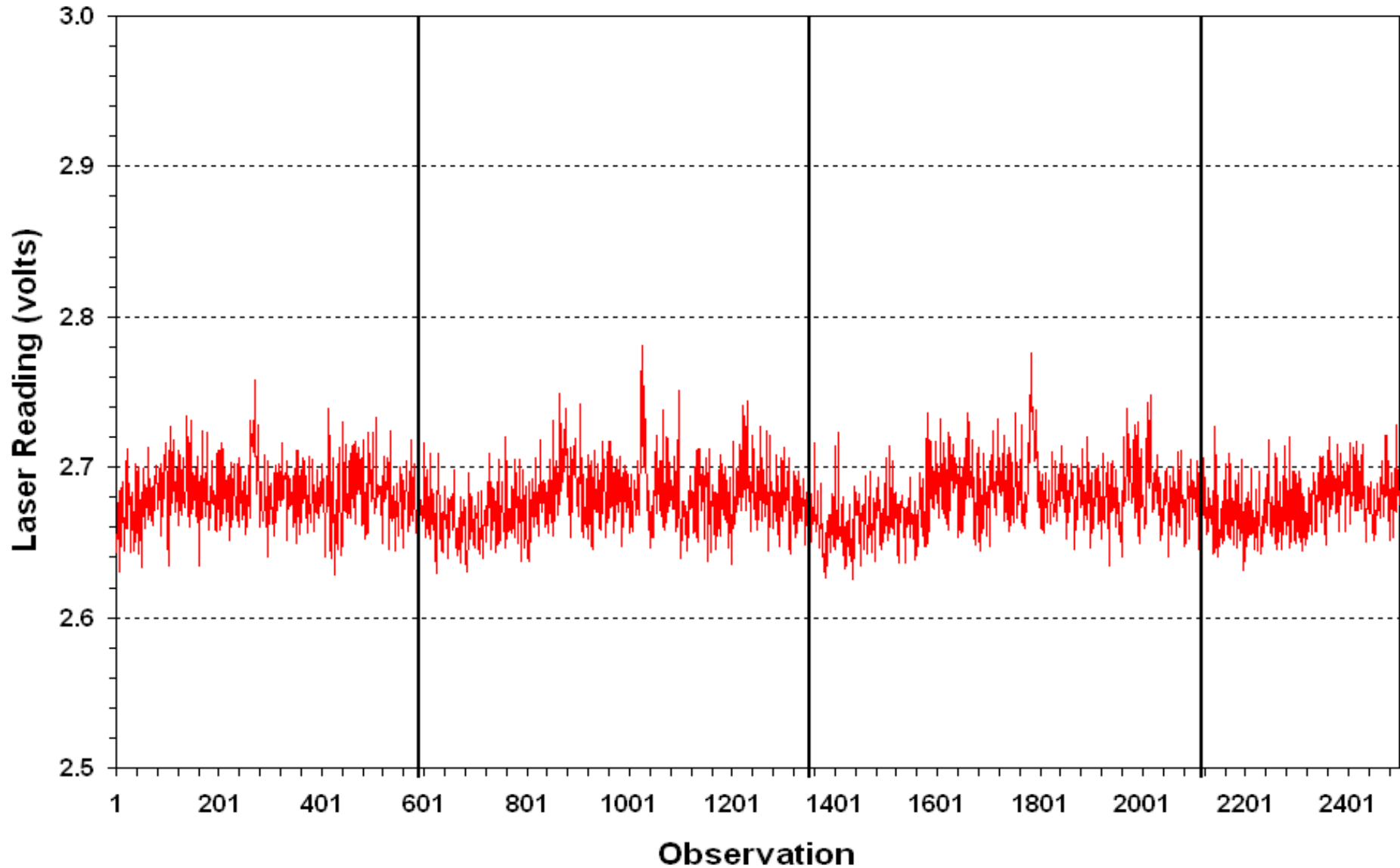
Grade 5 over 3



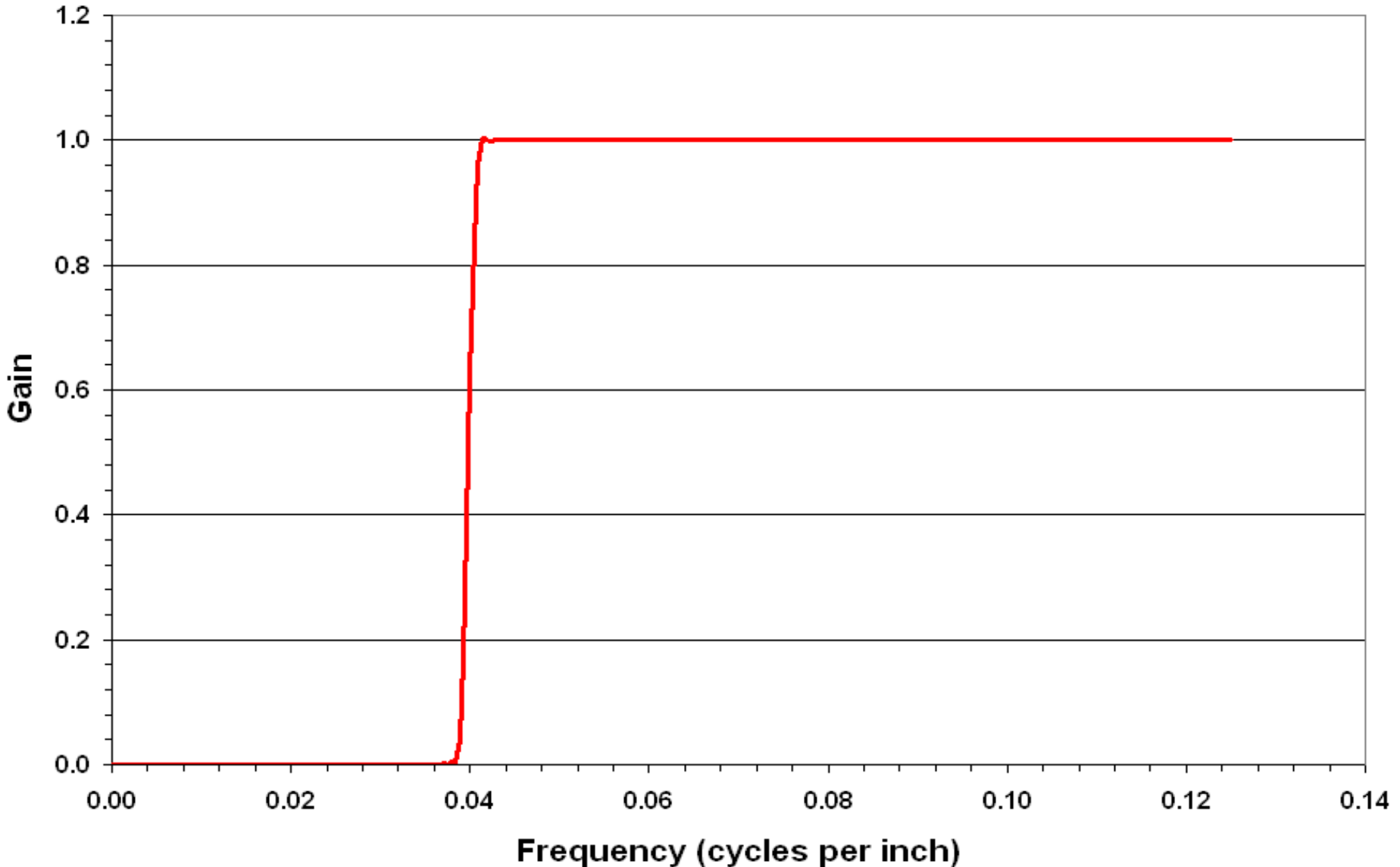
Analysis of Laser Test Data

- **Line up raw laser data from repeat runs**
- **Calculate profiles**
- **Take out specimen wobble**
- **Compute ride statistics**

Wobble Observed during Tests



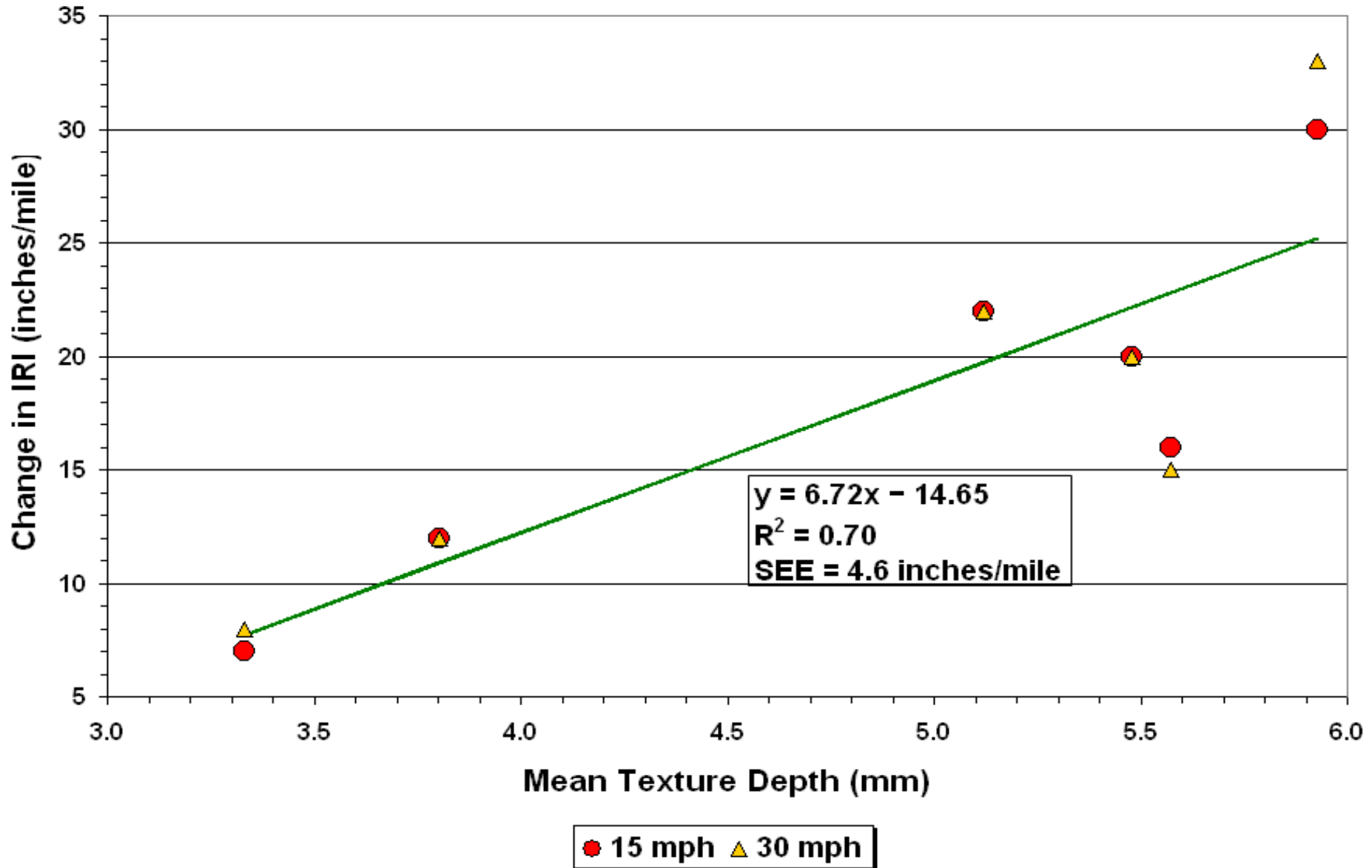
Wobble Filter Frequency Response



IRIs Computed from Test Profiles

Specimen	Test RPM	IRI (inches/mile)	
		Average	Std. deviation
Grade 3	315	25	0.86
Grade 4	315	23	0.36
Grade 5	315	10	0.21
Grade 3 over 3	315	19	0.29
Grade 4 over 3	315	33	0.51
Grade 5 over 3	315	15	0.93
Platter	315	3	0.01
Grade 3	630	25	0.93
Grade 4	630	23	0.35
Grade 5	630	11	0.22
Grade 3 over 3	630	18	0.30
Grade 4 over 3	630	36	0.56
Grade 5 over 3	630	15	0.41
Platter	630	3	0.01

IRI-Texture Relationship from Tests



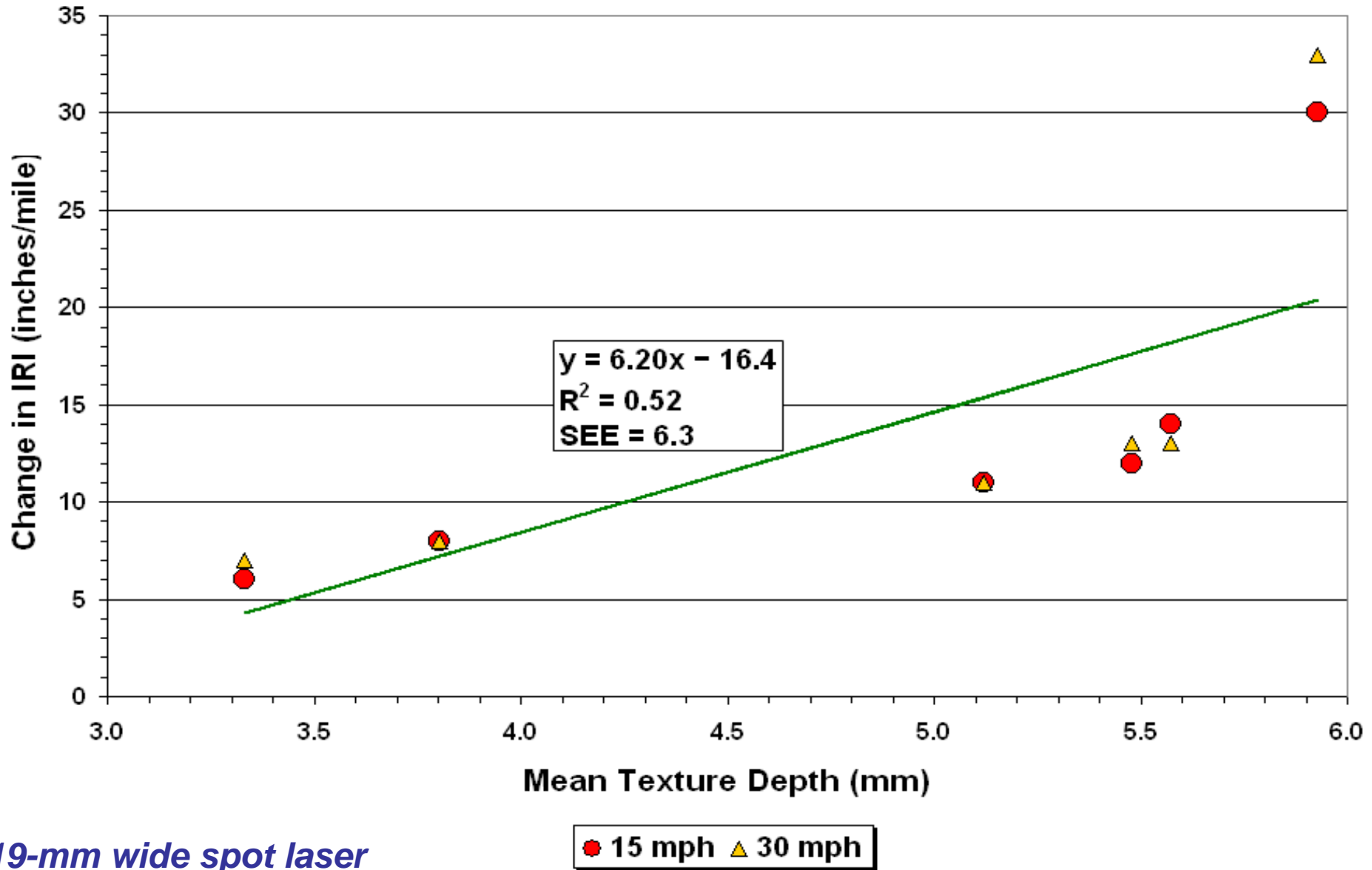
Investigation of Methods to Minimize Texture Effects



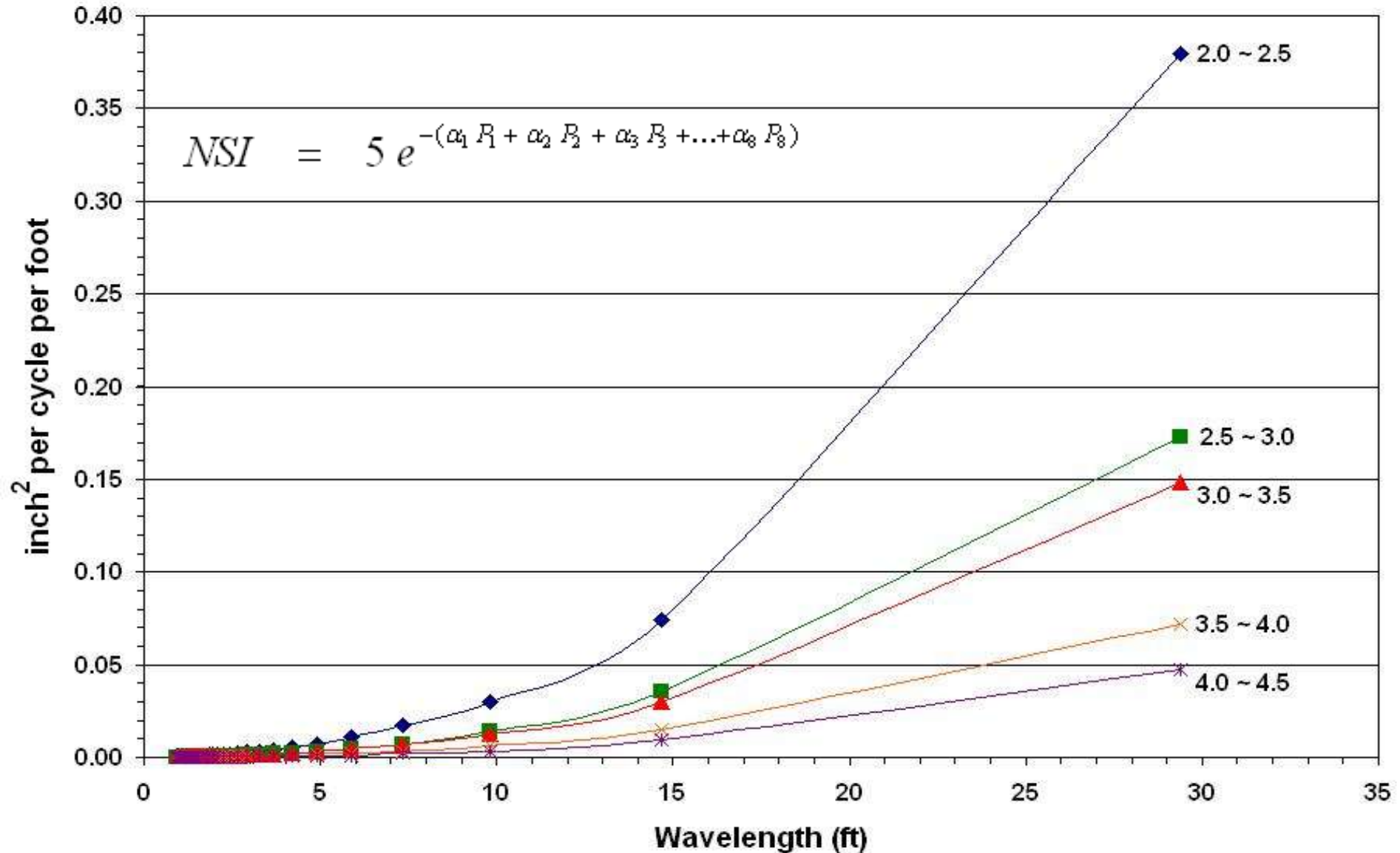
IRIs Computed from Test Profiles

Specimen	Test RPM	IRI (inches/mile)			
		Conventional		19 mm- wide spot	
		Avg.	Std. dev.	Avg.	Std. dev.
Grade 3	315	25	0.86	13	0.21
Grade 4	315	23	0.36	14	0.21
Grade 5	315	10	0.21	8	0.12
Grade 3 over 3	315	19	0.29	16	0.52
Grade 4 over 3	315	33	0.51	32	0.47
Grade 5 over 3	315	15	0.93	10	0.09
Platter	315	3	0.01	2	0.01
Grade 3	630	25	0.93	13	0.19
Grade 4	630	23	0.35	15	0.31
Grade 5	630	11	0.22	9	0.24
Grade 3 over 3	630	18	0.30	15	0.31
Grade 4 over 3	630	36	0.56	35	0.40
Grade 5 over 3	630	15	0.41	10	0.12
Platter	630	3	0.01	2	0.01

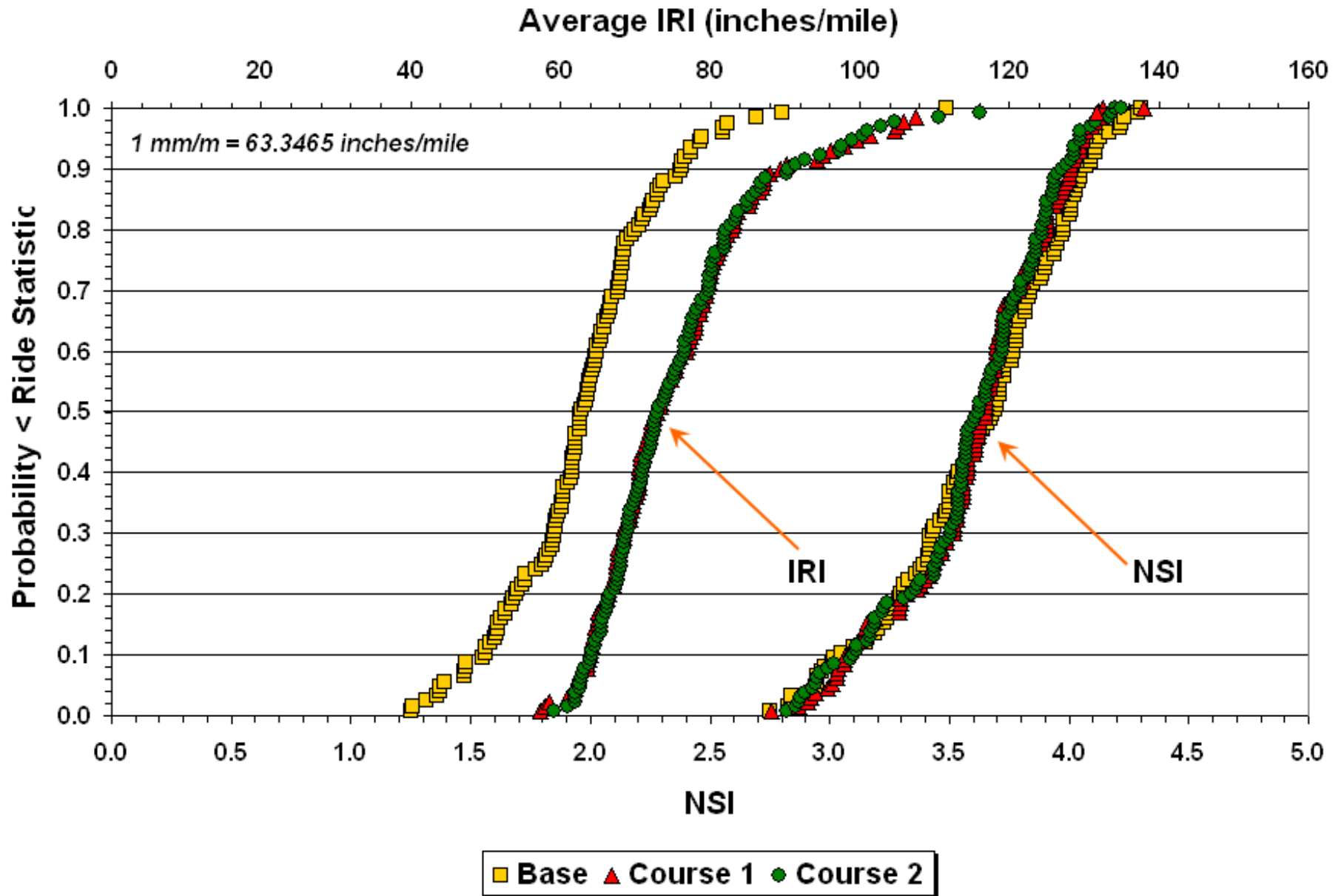
IRI-Texture Relationship from Tests



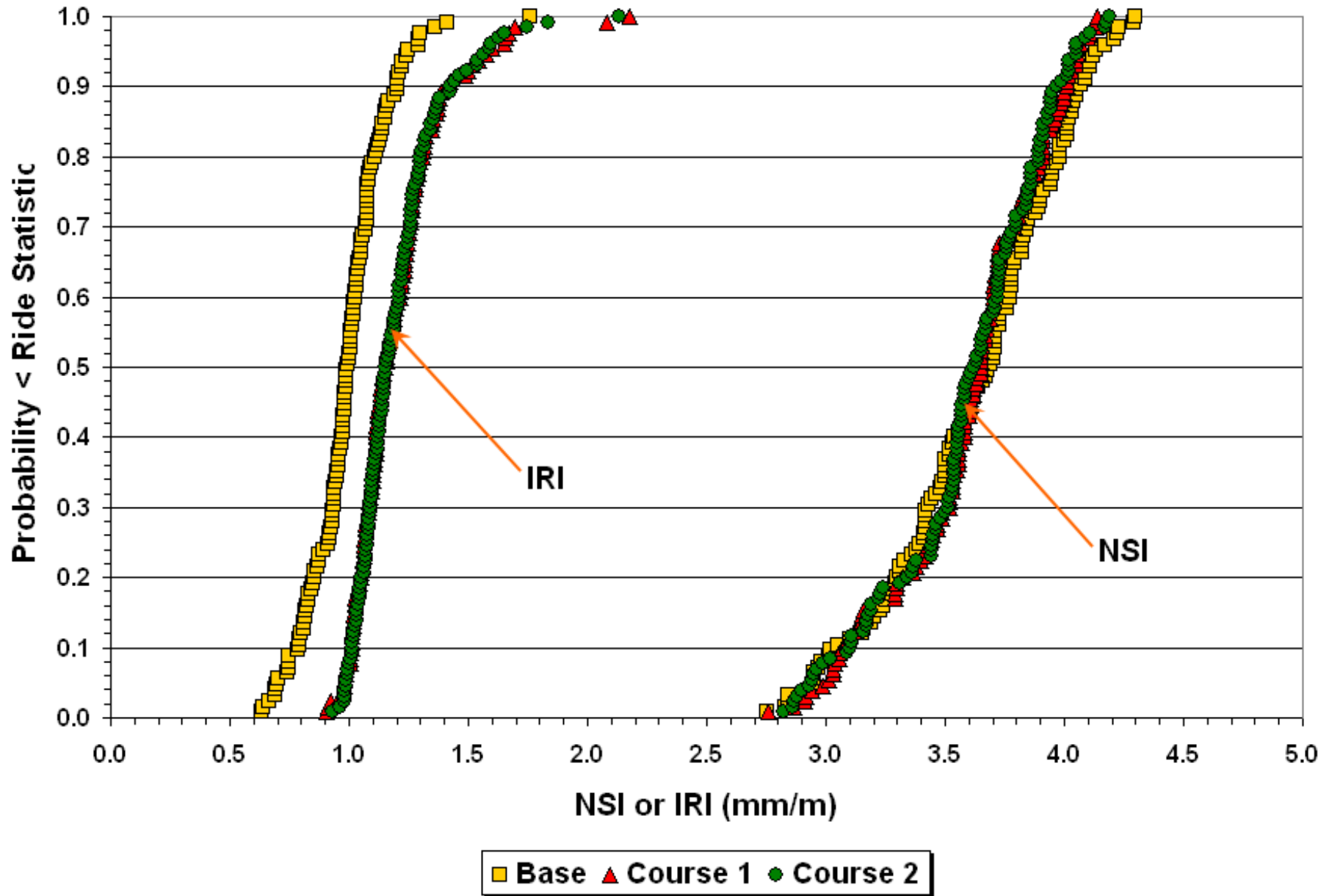
Wavelength-Based Ride Statistic



Observations from SH349 Project



Observations from SH349 Project





Summary of Findings

- **IRI generally found to increase after placement of surface treatment**
- **Lab results verified effect of texture on IRI**
- **Wide-spot IRIs found to be lower than conventional laser IRIs from lab test**
- **Wide-spot and conventional laser IRIs correlated with surface texture**
- **NSI not as affected by texture**

Why is texture affecting IRI?

Gain for Profile Slope $|H(v)|$

